AGS Polarimeters

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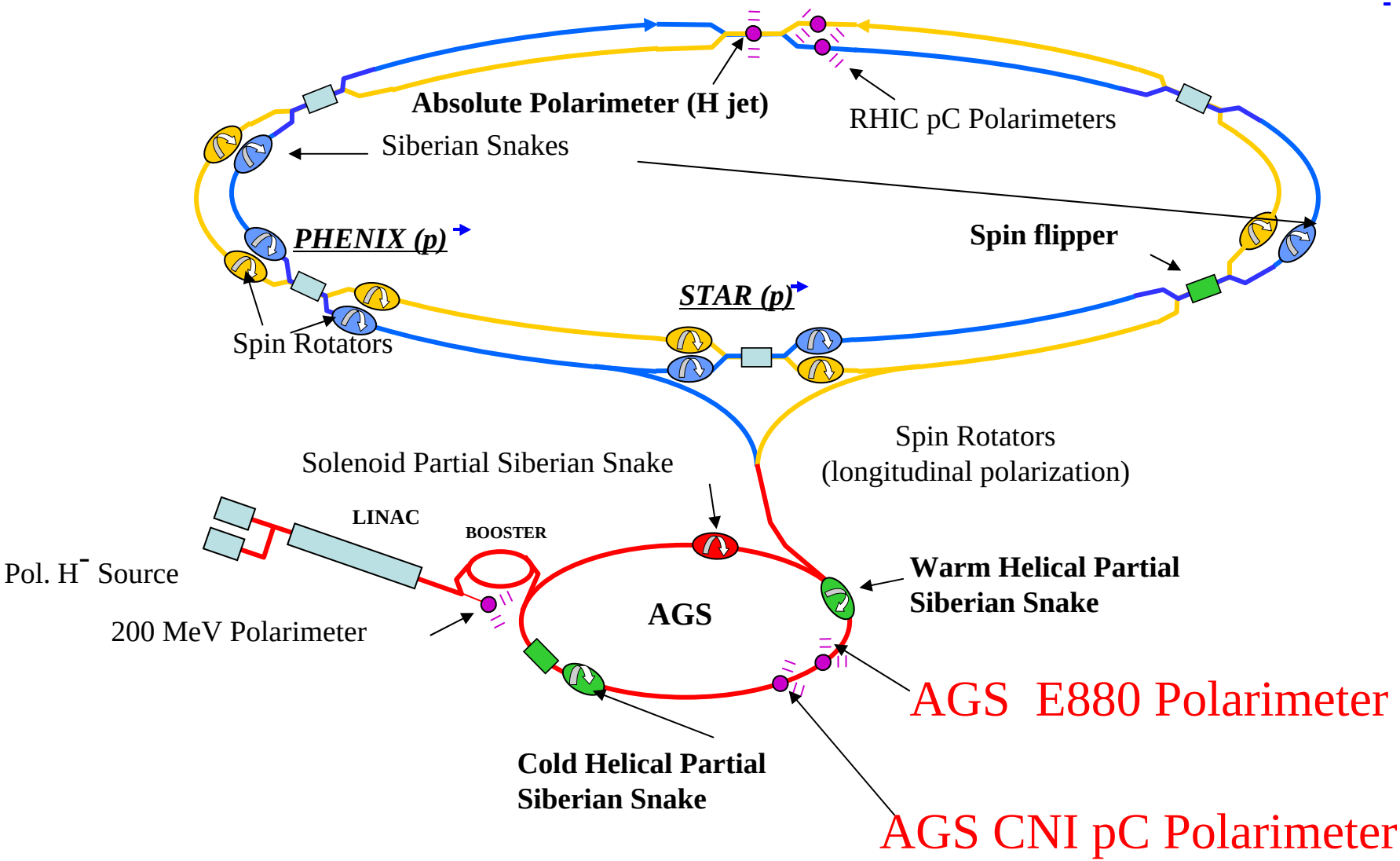
July 11, 2006
RHIC retreat

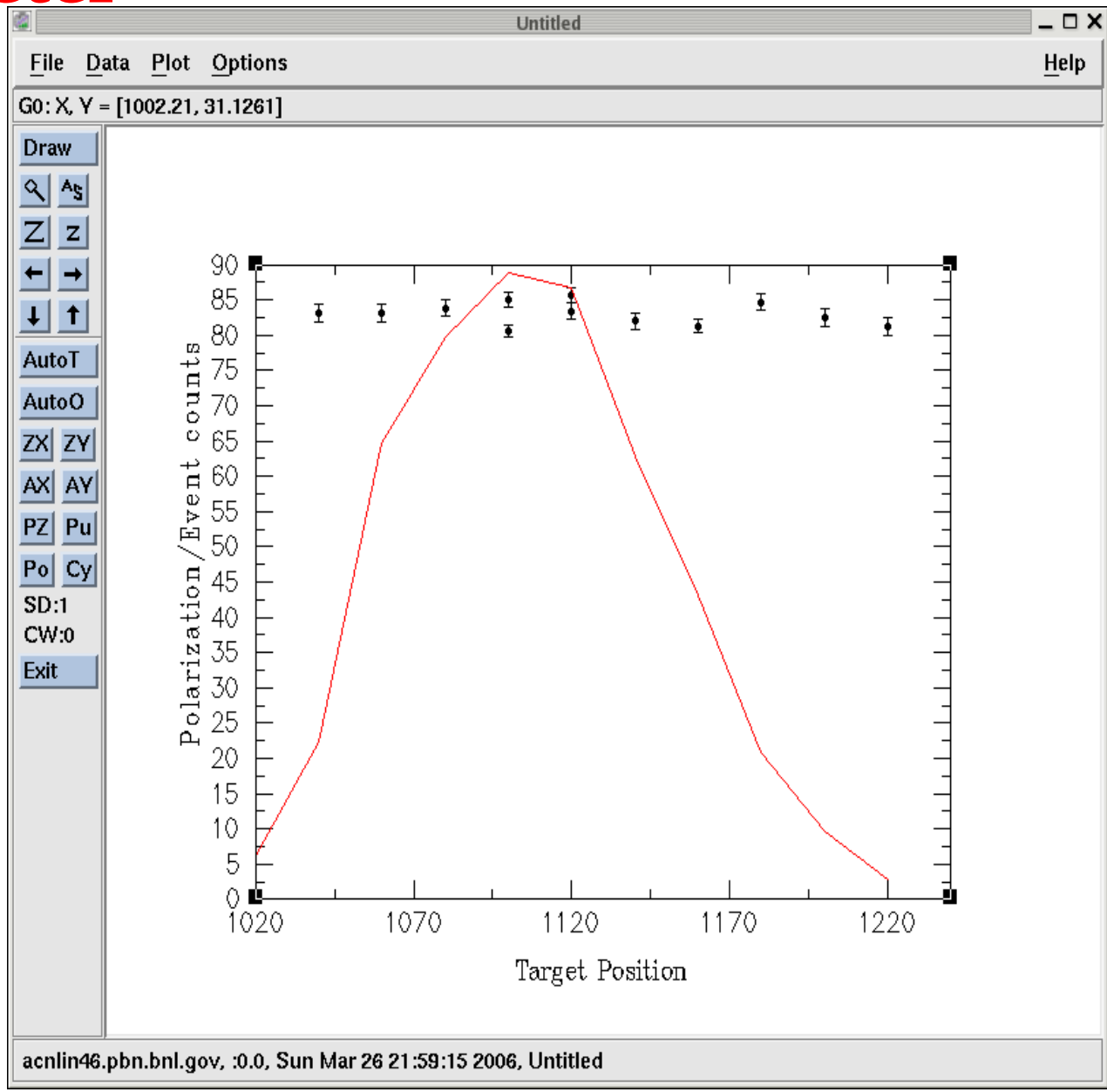
BROOKHAVEN
NATIONAL LABORATORY

Locations of AGS Polarimeters

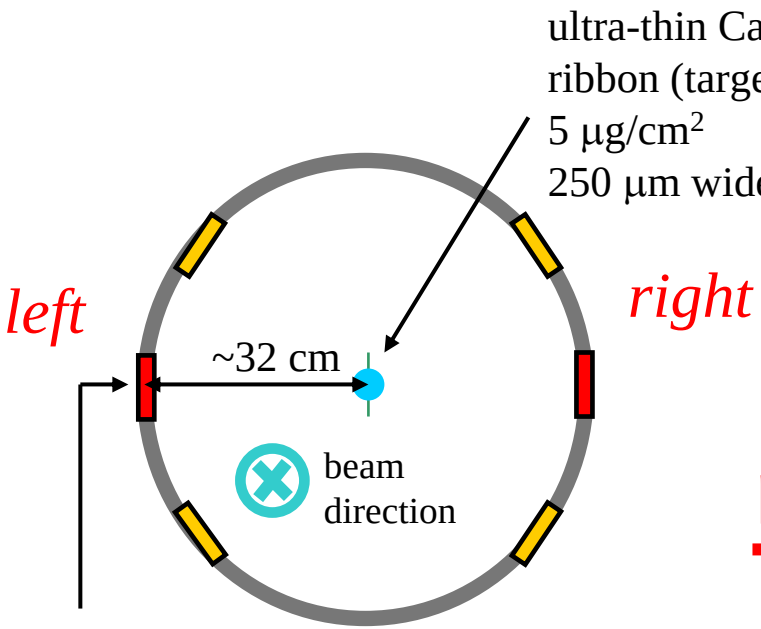


E880 Polarimeter

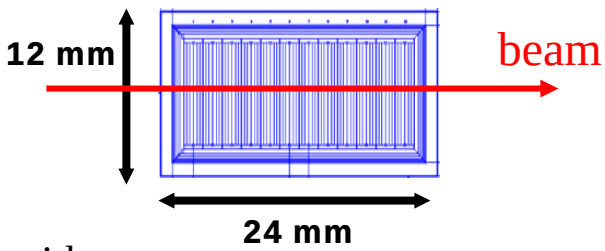
- E880 polarimeter is mainly used to provide the polarization information at injection energy.
- This measurement is important to make sure Booster depolarizing resonances are all corrected.
- It also can provide horizontal polarization profile measurement—it is flat.



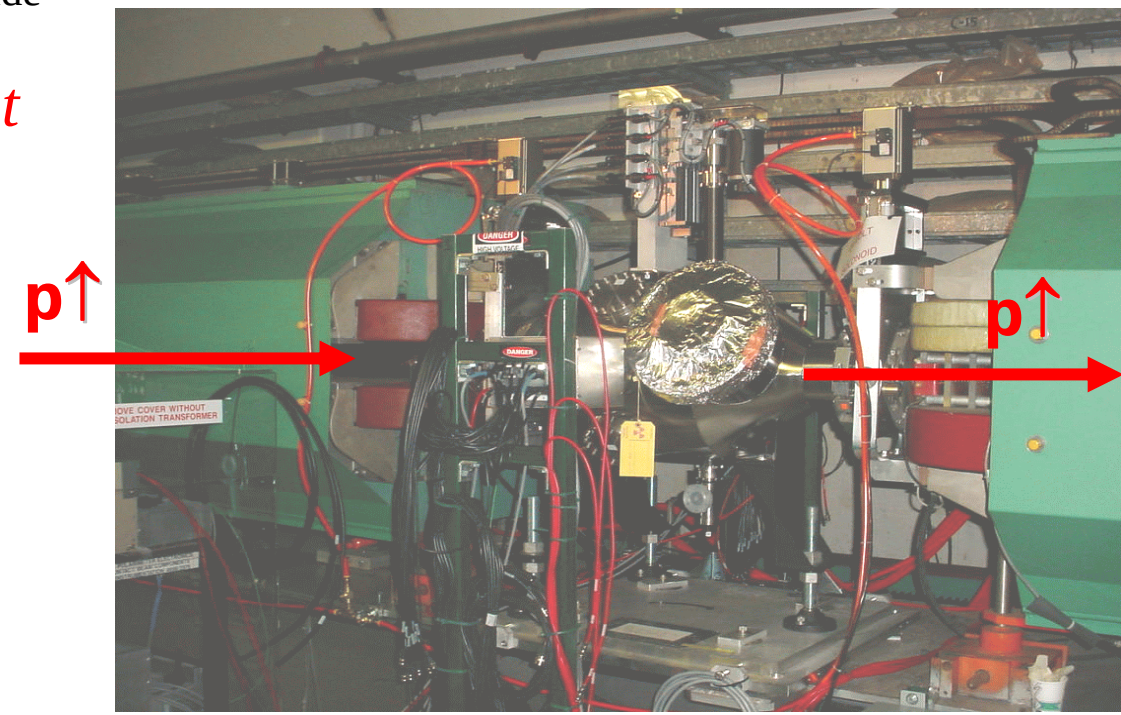
pC CNI Polarimeter in the AGS



Si strip detectors
12 vertical strips



read-out with
waveform digitizers



AGS CNI Polarimeter Target

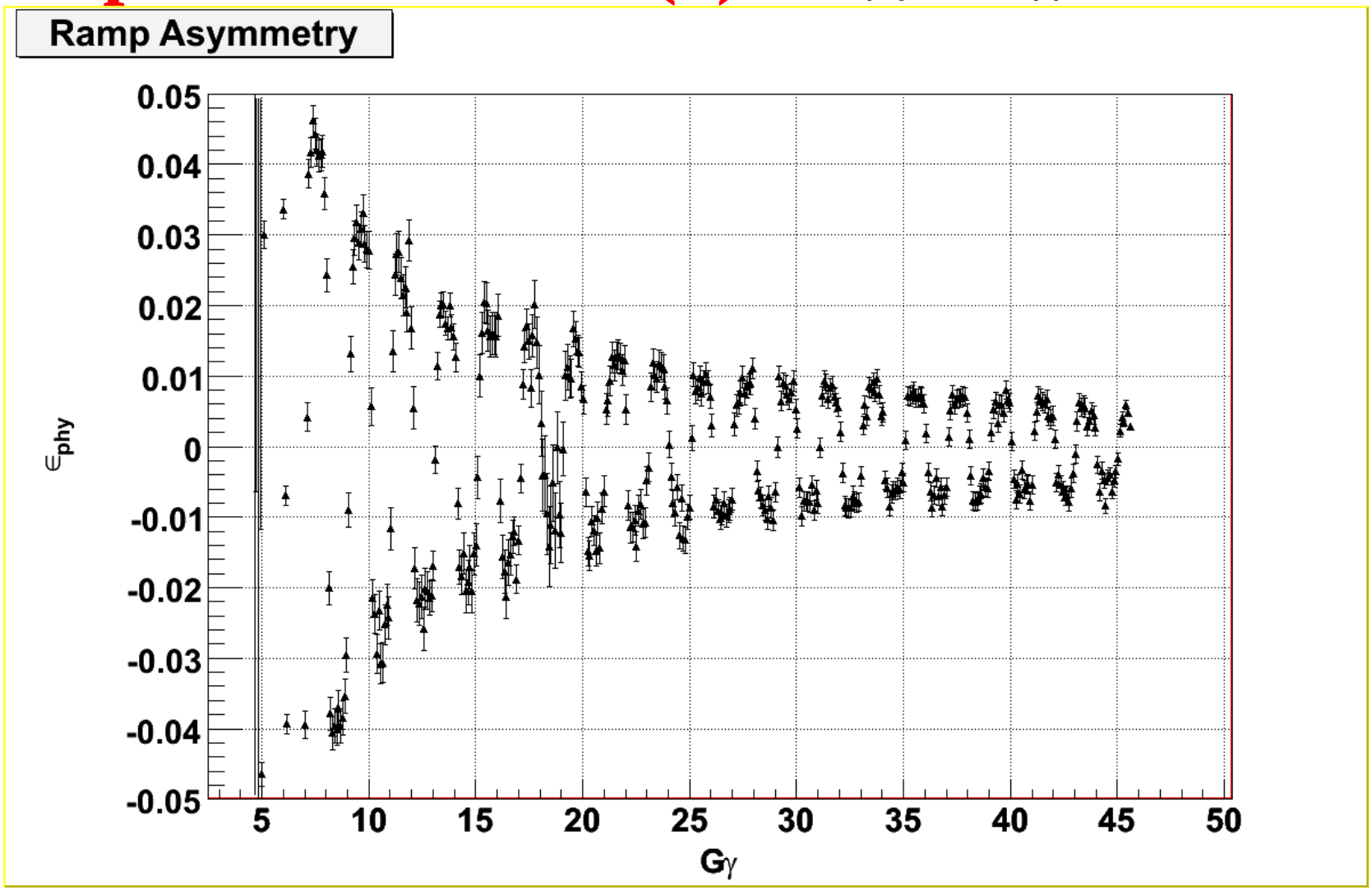
- Unlike RHIC polarimeter target, AGS target can survive the whole run. However, we often lost them when we open the vacuum to replace detectors. Not clear if bleed up speed is the cause.
- The rate would be high enough to cause concern of double hit for intensity higher than $1.5*10^{11}$.
- Some targets will give different beam size during target scan, perhaps not mounted tight.
- Narrower target (250μm->100μm) needs to be developed to get reliable measurement for intensity above $1.5*10^{11}$.

AGS CNI Polarimeter New Features

- Four 45 degree Si detectors and horizontal targets were added this year. The polarimeter provided vertical polarization profile and radial polarization information for the first time.
- The vertical polarization profile provided vital information on how well the vertical intrinsic resonances are overcome.
- The radial component provides additional information on how spin behaved at each spin flip.
- A new (faster) DAQ system has been developed (Kin/Igor/Dima). We can take up to 2 million events/AGS cycle.

Ramp Measurement (1)

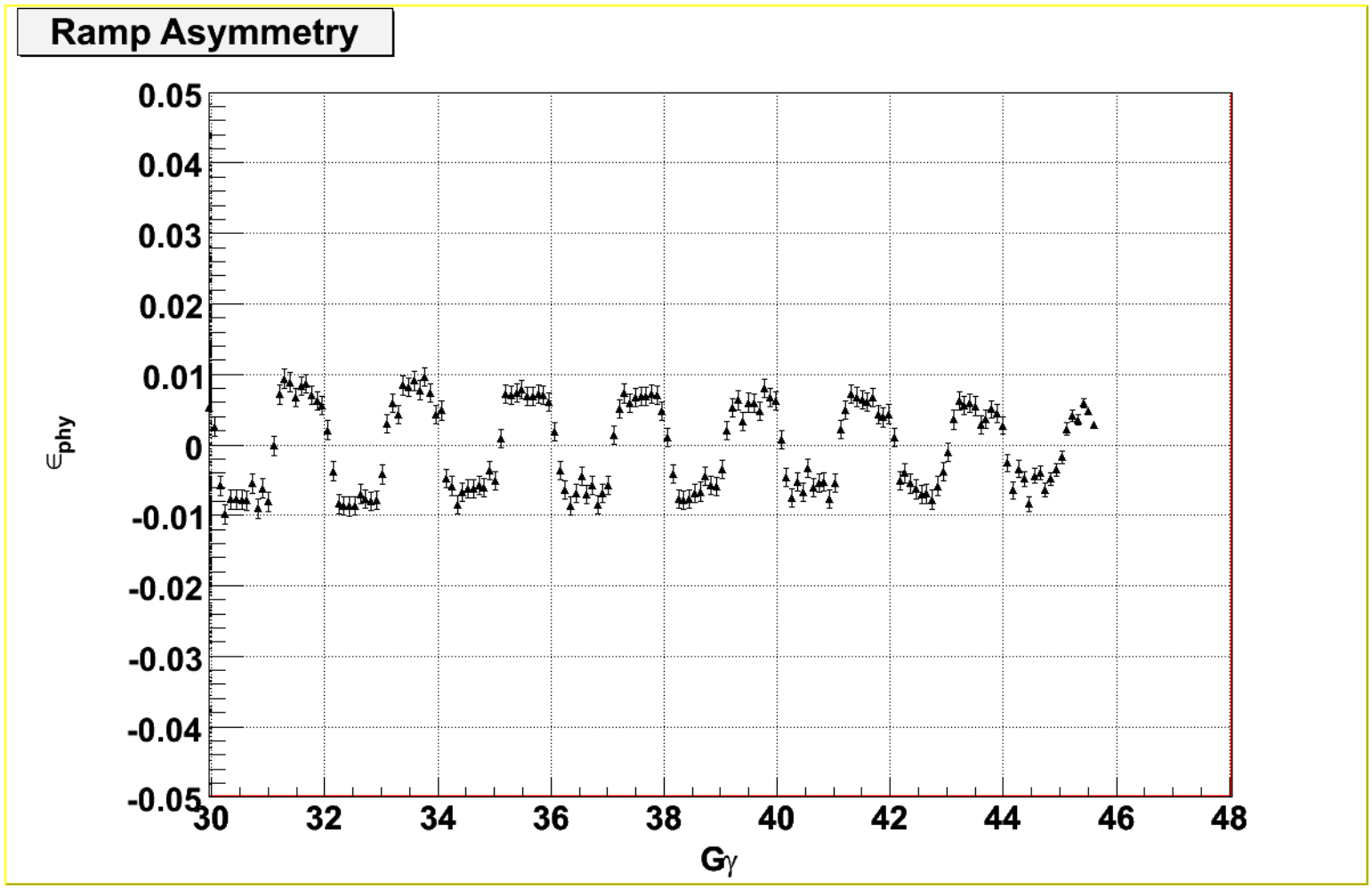
(By Kin Yip)



Total of 320 million events taken but only half is used for the analysis (only 90 degree Si detectors used). Note that there is not much data before Gγ=7.

Ramp Measurement (2)

(By Kin Yip)



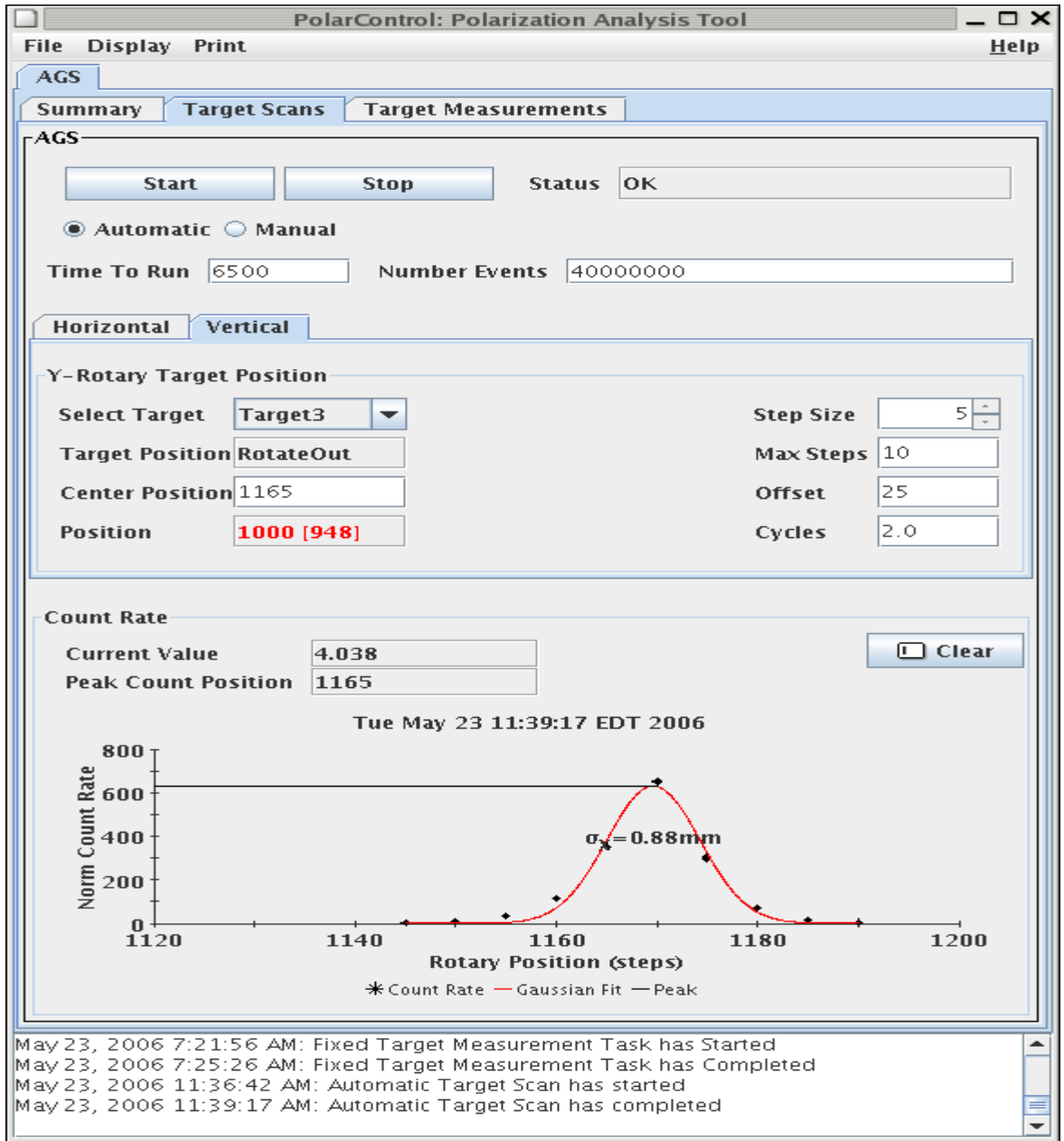
With total of eight runs, the error bars are already quite small. If data from 45 degree detectors are included, they can be further reduced.

Ramp Measurement (3)

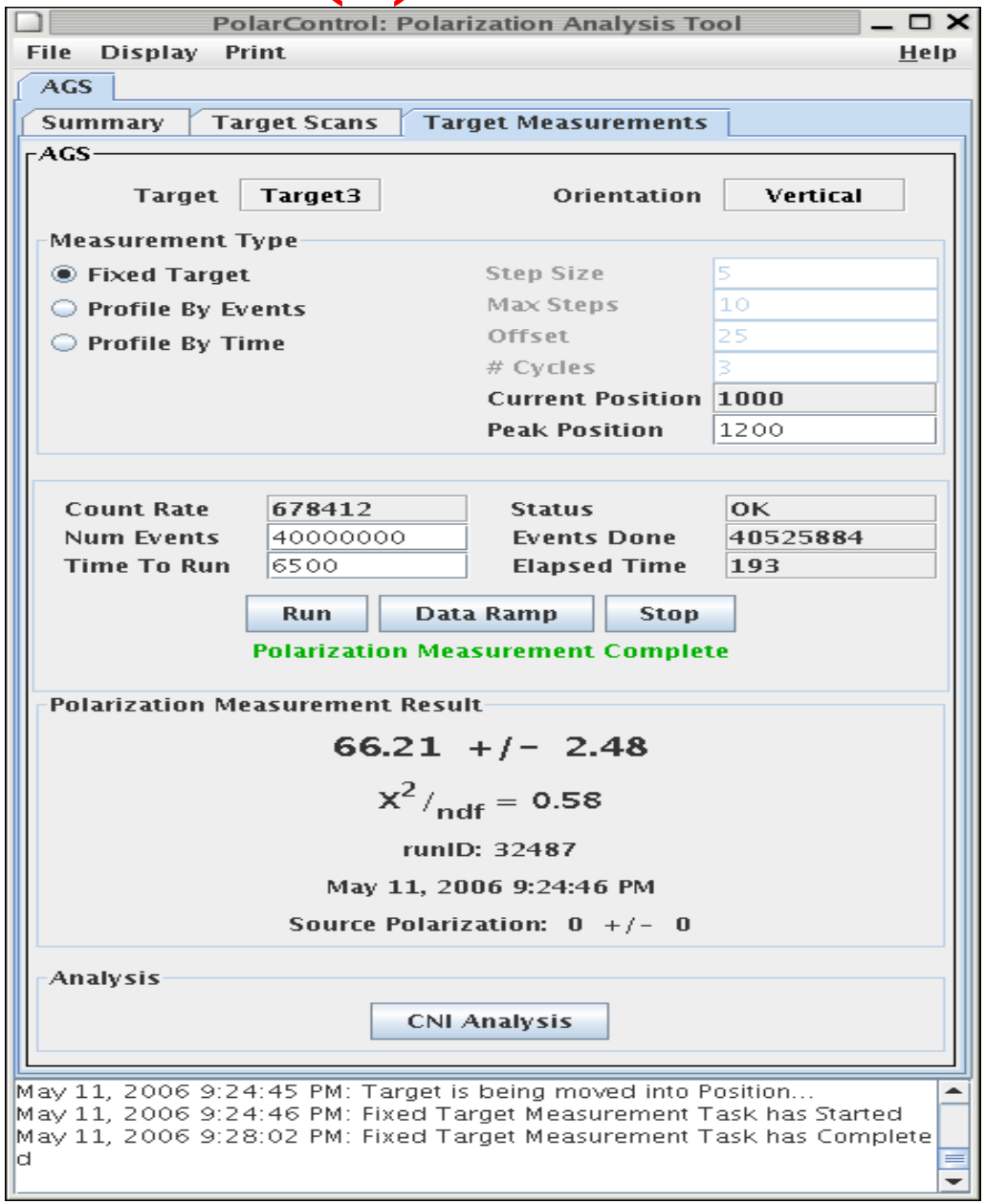
- The ramp measurement is a useful tool to identify any drastic polarization loss if the beam can be centered during the ramp.
- We would like to do more of these measurements next run with the capability to track beam along the ramp.
- Based on the BPM data around the polarimeter (C15), use BPM data around C15 to move target along the ramp. This has to be fast as the ramp is only 400ms. It is not a problem as the target actually can cross beam a few times during this time.
- The count rate along the ramp can be used to judge how well the alignment is.

Polar Control Application (1)

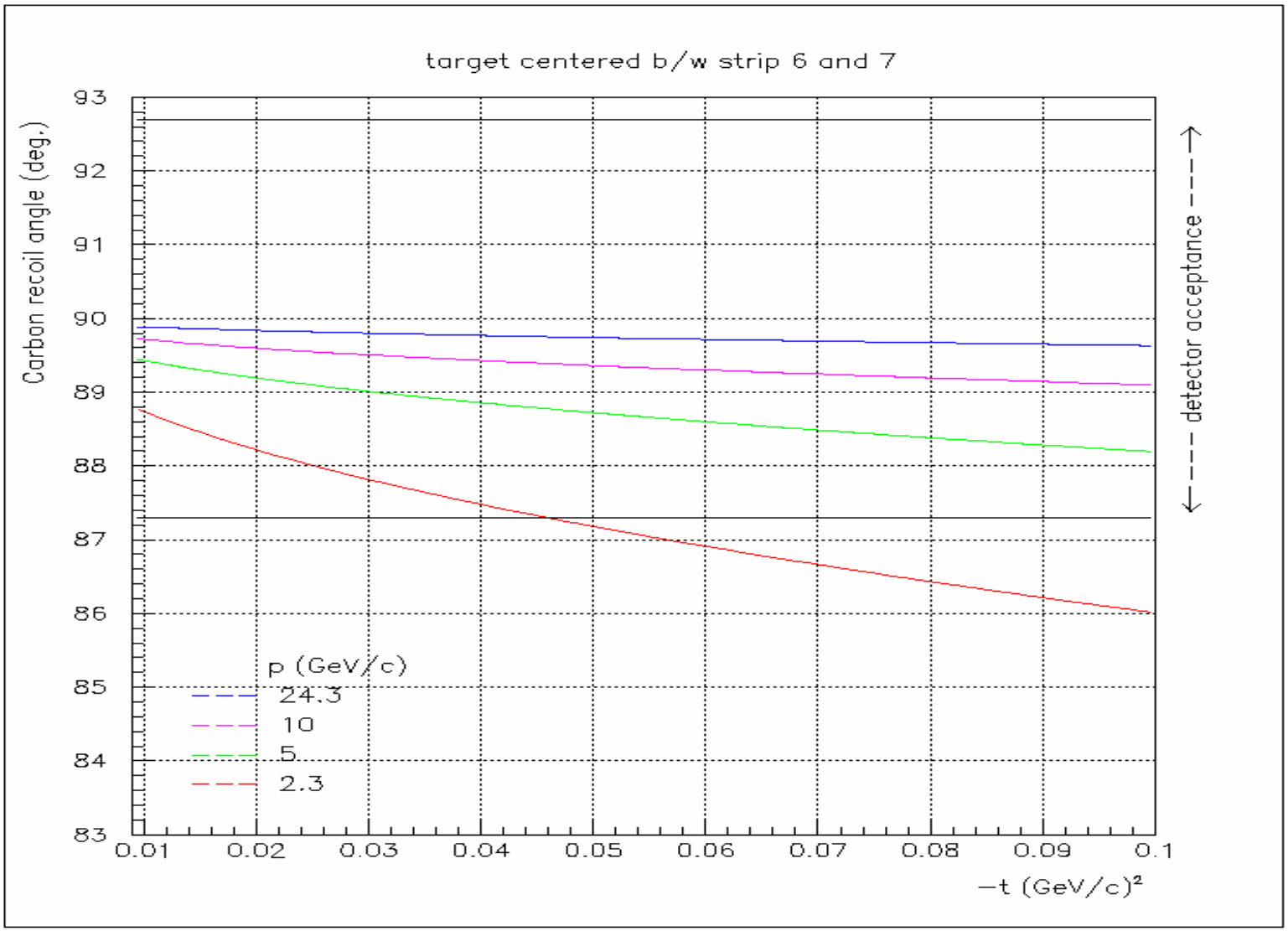
- The application is mainly developed by Seth with inputs from Kin, and Al.
- The beam profile can be obtained from the target scan. However, it takes 30 AGS cycles to do it.
- We would like to copy the RHIC method to get emittance by flying the target through the beam. The hardware work is underway.
- We also would like to have several (2 or 4) profile measurements in one AGS cycle.



Polar Control Application (2)



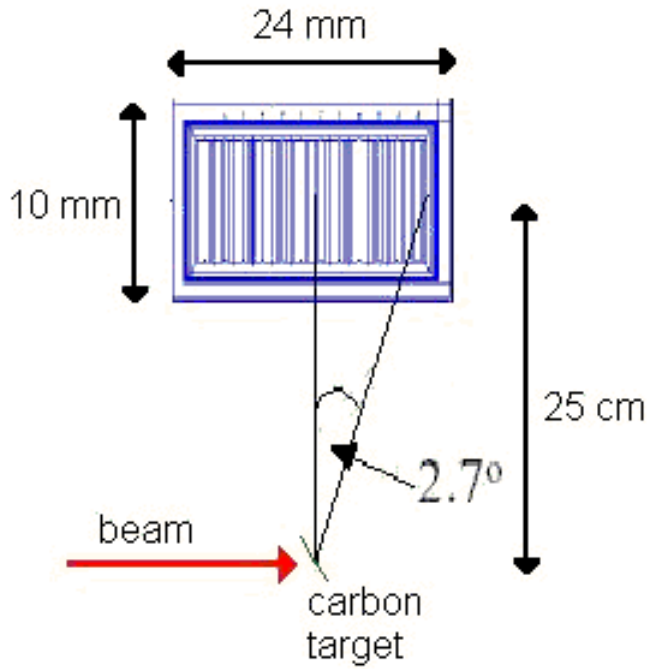
Si Detector Acceptance (1)



Si Detector Acceptance (2)

Recoil angle (θ) acceptance of the SSD:

$\Delta\theta = 90° \pm 2.7°$



If we shift the target position back:

target shift	**recoil angle acceptance**
2 mm	92.3° > Δθ > 86.8°
5 mm	91.6° > Δθ > 86.1°
7 mm	91.1° > Δθ > 85.7°

We will install a target with a position shift to use the polarimeter at injection energy.

Other Issues

- Bias HV power supply inside the ring has tripped four times during this run and all were due to power dip. We will add remote control for the power supply during this summer shut down.
- The 45 degree Si detectors were only used in the relative sense when horizontal targets were used, since these detectors could not be calibrated with the Am source installed. The new Am sources will be installed this summer. For the data already taken, the offline analysis will include these data to get smaller error bar.
- The gear boxes added for the horizontal targets smoothed the target motion. We will add gear boxes for vertical target to get fine steps for the vertical targets, too.